REMARKS

The last Office Action of January 31, 2001 has been carefully considered. Reconsideration of the instant application in view of the foregoing amendments and the following remarks is respectfully requested.

Claims 1 to 11 are pending in the application.

It is noted that the drawings are objected to because of applicant's failure to label Fig. 1 as "prior art. It is further noted that claims 3 and 5 are objected to under 35 U.S.C. §1.75(c), as being of improper dependent form to further limit the subject matter of a previous claim.

Claims 1-2 and 4 stand rejected under 35 U.S.C. §103(a) as being unpatentable over the admitted prior art to Safyurtlu (CA 1 164 990 A) in view of U.S. Pat. No. 5,909,456 (hereinafter "Oka").

Claims 3, 5 and 10-11 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Safyurtlu and Oka, and further in view of U.S. Pat. No. 5,699,376 (hereinafter "Richmond").

Claims 6 and 8 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Safyurtlu and Oka, and further in view of U.S. Pat. No. 6,129,721 (hereinafter "Kataoka").

Claims 7 and 9 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Safyurtlu Oka and Richmond, and further in view of Kataoka.

OBJECTION TO THE DRAWING

Applicant amended FIG. 1, as suggested by the Examiner. The Examiner is requested to approve the drawing. Withdrawal of the objection to the drawing is thus respectfully requested.

REJECTION UNDER 37 C.F.R. 1.75(c)

Applicant has canceled claim 9. The objection to claim 3 has been addressed by amending claim 1, from which claim 3 depends, and amending claim 3. Independent claim 1 now recites that the output mirror is arranged in close proximity to the other end of the laser rod, whereas claim 3 now sets forth that the output mirror is formed by the other end of the laser rod. The objection to claim 5 has been addressed by drafting claim 5 in independent form. Applicant asserts that the amendments to claims 1 and 5 have not narrowed these claims within the meaning of the *Festo*-decision. *Festo Corp. v. Shoketsu Kinsoku Kogyo Kabushiki Co.*, 56 USPQ2d 1865 (Fed. Cir. Nov. 29, 2000)(en banc).

Withdrawal of the objection to claims 3 and 5 under 37 C.F.R. 1.75(c) is thus respectfully requested.

REJECTION UNDER 35 U.S.C. §103(a)

The rejection of claims 1 and 2 under 35 U.S.C. §103(a) as being

unpatentable over Safyurtlu in view of Oka is hereby traversed and reconsideration thereof is respectfully requested in view of Amendments to the claims contained herein.

Claim 1, as amended herein, is directed to a stable resonator for solid-state lasers, which exhibit a thermally induced lensing effect. The stable resonator includes a laser rod, a rear mirror and a semi-reflecting output mirror. The rear mirror is convex, the end of the laser rod facing the rear mirror is also convex, and the output mirror is arranged in close proximity to the other end of the laser rod. The output mirror is semi-reflecting. Claims 2-3, 6, and 10 depend from claim 1.

The Safyurtlu reference discloses an unstable resonator with collimating optics which are bonded together to form an integral assembly with a Q-switch. As best seen from the only Figure, the resonator has a laser gain medium 12 having a partially reflective output surface 14 which acts as a flat resonator element and which operates in conjunction with a convex resonator element 16. Element 20 is the passive Q-switch. Safyurtlu does not teach or suggest that either of the end faces of the laser rod is convex. More particularly, Safyurtlu does not disclose or suggest that the end face of the laser rod facing the convex mirror is convex.

Oka discloses a laser beam generator, which generates a second harmonic laser beam under type-II phase matching conditions. Oka shows a resonator in which the rod (35) has a convex side (35a) opposite the side of the

rear mirror (34). The Examiner asserts that it would be obvious to use Oka's laser rod with the present invention.

Applicant disagrees. As Oka points out (col. 11, lines 10-22):

> "*The surface 35a of the laser medium 35 is convex for preventing the laser beam incident on the non-linear optical crystal element 36 from being enlarged in diameter, [...] That is, ... , the fundamental laser beam diminished in diameter by the convex surface 35a of the laser medium 35 is caused to be incident on the non-linear liquid crystal element 36 for efficiently generating the second harmonic laser beam*."

As is known in the art, second harmonic generation depend on the square of the incident optical power of the fundamental beam. The purpose of the convex surface of the laser rod is therefore, as clearly stated by Oka, to diminish the diameter of the laser beam, i.e., to increase its power density, for efficiently generating the second harmonic laser beam.

Conversely, the "sweet spot" resonator of the present invention is a stable resonator and designed so that the beam diameter inside the laser crystal remains as large as possible to reduce the thermal and optical load on the laser rod, thereby increasing the useful optical power output. The curved end surface of the laser rod moreover helps to reduce the overall length of the resonator to make the device more compact.

Since, as discussed above, Applicant's configuration does not desire a high optical power density necessary for second harmonic generation, Applicant would have no motive to combine the two references. More importantly, Applicant strongly disagrees with the Examiner's misguided assertion that "Even though [*Oka's*] Fig. 9 shows the front surface as the one being convex, this statement provides motivation that the front surface may be planar and the rear convex" or, on the same page of the Office Action, that switching the planar side and convex side of the rod is an obvious rearrangement of parts.

Interchanging the planar side and convex side changes the ray trace inside the optical element, in this case the laser rod. As taught in elementary optics textbooks, even in a passive lens system which includes a thick lens, the two lens surfaces of the thick lens cannot be simply interchanged without affecting not only the ray trace inside the optical element, but the ray properties of the entire system. Therefore, in particular since the laser rod is an active medium with an appreciable thickness, the ray trace inside the laser rod will determine the lasing characteristic of the system of the invention. As described with particularity on page 4, lines 2 to 9 of the instant specification:

> "*The Applicant has realized that, unlike in state-of-the-art devices, the beam quality as a function of the pump power has a comparably flat maximum for relatively short resonator lengths due to the extremely asymmetric construction of the resonators according to the invention. Accordingly, the applicant achieves a*

comparably constant beam quality over a larger pump power range. As a result, the thermal lensing effect has no effect or only an insignificant effect on the welding result; the characteristics features of the initial pulse are negligibly small."

In summary, Safyurtlu and Oka, taken either alone or in combination, do not disclose, teach or suggest that "the end of the laser rod facing the rear mirror is also convex," as recited claim 1. Accordingly, Applicant respectfully requests that the rejection of claim 1 be withdrawn. Richmond teaches neither a convex mirror nor a convex end face of the laser rod. Claims 2, 3, 6, and 10 should therefore be patentable over the references of record for the same reasons that claim 1 is patentable.

The rejection of claim 4 under 35 U.S.C. §103(a) as being unpatentable over Safyurtlu in view of Oka is hereby traversed and reconsideration thereof is respectfully requested in view of Amendments to the claims contained herein.

Claim 4, as amended herein, is directed to a stable resonator for solid-state lasers, which exhibit a thermally induced lensing effect. The stable resonator includes a laser rod, a rear mirror and a semi-reflecting output mirror. The rear mirror is convex, the end of the laser rod facing the rear mirror is planar, the other end of the laser rod is convex, and the output mirror is formed by the other end of the laser rod, wherein this end is semi-reflecting. Claim 8 depends from claim 4.

Neither Safyurtlu nor Oka disclose a laser configuration wherein the end of the laser rod is convex and the output mirror is formed by the other end of the laser rod. Fig. 9 of Oka shows the surface 35a as being convex. However, as described in col. 11, lines 10-18 of Oka, the surface 35a of the laser medium is convex for preventing the laser beam incident on the nonlinear crystal from being enlarged in diameter, whereas the fundamental laser beam generated in the laser medium 35 is reciprocated between the reflecting surface 34R (*which is flat*) and 35R (*which is also flat*) of the laser resonator 33 to effect oscillation of the laser beam." (col. 11, lines 6-9). Accordingly, Applicant respectfully requests that the rejection of claim 4 be withdrawn.

The rejection of claims 3 and 10 under 35 U.S.C. §103(a) as being unpatentable over Safyurtlu and Oka as applied to claim 1, as well as of claims 5 and 11 over the same references, is hereby traversed and reconsideration thereof is respectfully requested in view of Amendments to the claims contained herein.

With reference to claim 3, Richmond does not supply the element missing from the Safyurtlu and Oka references, namely that the rear mirror is convex and the end of the laser rod facing the rear mirror is also convex, as recited in claim 1 from which claims 3 and 10 depend.

With reference to claims 5 and 11, neither Richmond (see in particular Fig. 5) nor Safyurtlu and Oka disclose a convex rear mirror in combination with the other convex end face of the laser rod, as recited in amended claim 5. Applicant points out that the other end face (14) in Safyurtlu's Figure is planar,

since the lens (22) is not part of the laser cavity. Claim 5 should therefore be patentable over the references of record. Accordingly, Applicant respectfully requests that the rejection of claims 3, 5 and 10-11 be withdrawn.

For the reasons set forth above, it is applicant's contention that neither Safyurtlu nor Oka, nor Richmond, nor Kataoka, nor any combination thereof teaches or suggests the features of the present invention, as recited in claims 1, 4 and 5.

As for the rejection of the retained dependent claims, these claims depend on claims 1, 4 and 5 and share their presumably allowable features, and therefore it is respectfully submitted that these claims should also be allowed.

Withdrawal under 35 U.S.C. §103(a) and allowance of claims 1-8, and 10-11 are thus respectfully requested.

CLARIFICATION AMENDMENT

Claims 6-8 have been amended in the manner as suggested by the Examiner by adding --or -- before "Nd:glass".

The amendments to claims 4 and 10 are "cosmetic" to conform to non-statutory formal requirements imposed by the U.S. patent and Trademark Office, notwithstanding applicant's belief that claims 4 and 10, as originally filed in this context were clear. Accordingly, applicant asserts that the amendments to claims 4 and 10 have not narrowed these claims within the meaning of the *Festo-*

decision. *Festo Corp. v. Shoketsu Kinsoku Kogyo Kabushiki Co.*, 56 USPQ2d 1865 (Fed. Cir. Nov. 29, 2000)(en banc).

CITED REFERENCES

Applicant has also carefully scrutinized the further cited prior art and finds it without any relevance to the newly submitted claims. It is thus felt that no specific discussion thereof is necessary.

CONCLUSION

Applicant believes that when the Examiner reconsiders the claims in the light of the above comments, he will agree that the invention is in no way properly met or anticipated or even suggested by any of the references however they are considered.

In view of the above presented remarks and amendments, it is respectfully submitted that all claims on file should be considered patentably differentiated over the art and should be allowed.

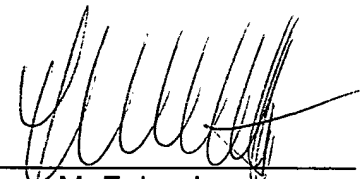
Reconsideration and allowance of the present application are respectfully requested.

Should the Examiner consider necessary or desirable any formal changes anywhere in the specification, claims and/or drawing, then it is respectfully requested that such changes be made by Examiner's Amendment, if the

Examiner feels this would facilitate passage of the case to issuance. If the Examiner feels that it might be helpful in advancing this case by calling the undersigned, applicant would greatly appreciate such a telephone interview.

The Commissioner is hereby authorized to charge fees which may be required, or credit any overpayment to Deposit Account No. 06-0502.

Respectfully submitted,



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